

Supplemental Amendment under 37 CFR § 1.111
Application No. 10/775,075
Attorney Docket No. 042100

REMARKS

Claims 1-11 are pending in the application. Claims 1 is herein amended. Claims 7-9 are withdrawn from consideration. No new matter has been added to the application.

Interview

Applicant's undersigned attorney conducted an interview with the Examiner on April 10, 2006. Diagrams of an electrodeposited copper foil of the present invention, *Fatcheric*, and *Wolski* were submitted at the interview. The diagrams demonstrated the rough surface of the foils and the roughness of the rough surface before and after treatment of the rough surface. In addition, SEM photographs were submitted demonstrating Example C and comparative Example D from the present specification.

An amendment was proposed to change the claimed roughness range of the rough surface to 2.2 to less than 4 μm . The Examiner took the position that the proposed range, if not anticipated, is likely obvious over *Fatcheric* and *Wolski*. (Interview Summary, April, 10, 2006.)

Claim Rejections - 35 U.S.C. § 112

Claims 5 and 6 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite because of the limitation beginning with "and according to need." Claims 5 and 6 have been amended to remove the limitation beginning with "and according to need." Withdrawal of the rejection is requested.

Claim Rejections - 35 U.S.C. § 102

Claims 1-6 were rejected under 35 U.S.C. § 102(b) as being anticipated by **Fatcheric** (U.S. Patent 5,679,230); and claims 1, 2 and 4 were rejected under 35 U.S.C. § 102(b) as being anticipated by **Wolski** (U.S. Patent 5,834,140 which corresponds exactly to Japanese Patent Publication No. 3313277 disclosed on page 6, line 8 of the present specification). Favorable reconsideration of the rejections is requested.

In an electrodeposited copper foil of the present invention, knob-like projections are formed intermittently on the smooth matte side surface as recited in amended claim 1. (Specification, page 10, lines 16-21; Figs. 1-3.) The surface roughness is as small as 2.2 to less than 4 μm . After roughening, the surface roughness becomes 4 to 7.1 μm .

Note that micro nodules of *Fatcheric* and copper nodules of *Wolski* are thought of as roughening particles, and the knob-like projections of the present invention express a characteristic of the rough side of an untreated copper foil.

A. § 102 Rejection Based on *Fatcheric*

Applicant respectfully submits that *Fatcheric* does not disclose “an electrodeposited copper foil wherein knob-like projections are formed intermittently on its smooth matte side surface and a surface roughness thereof is 2.2 to less than 4 μm ” as recited in amended claim 1.

In *Fatcheric*, an electrolytically deposited copper foil has shapes of mountains and valleys provided on the matte side of the foil. (*Fatcheric*, Fig. 2.) The mountains and valleys are formed **continuously** on the copper foil surface. (*Fatcheric*, Fig. 2.) The **surface roughness of the**

matte side is **4 to 7.5 μm before and after roughening**. (Col. 3, lines 18-21 and 31-33.) In *Fatcheric*, the roughening particle size is 0.5 μm . (Col. 5, lines 6-7.) The shape of matte side is "relatively smooth," (col. 2, line 30), thus the shapes of mountains and valleys are formed uniformly and continuously all over the matte side, as is the general shape of the matte side of an electrolytically deposited copper foil.

By contrast, in the present invention, the knob-like projections are formed on the rough side non-uniformly and intermittently as shown in Figs. 1 to 3 of the present invention, which is quite different from the matte shape of the copper foil of *Fatcheric*. The roughening particle size of the present invention is 1 to 3 μm as opposed to 0.5 μm in *Fatcheric*.

In the interview of April 10, 2006, the Examiner interpreted the shiny side of *Fatcheric* to be encompassed within the scope of "the rough surface" in claim 1. The shiny side of *Fatcheric* is disclosed as having a roughness of 2 μm or greater, (col. 3, lines 18-19), which the Examiner interpreted as anticipating the "surface roughness of 2.2 to less than 4 μm " in amended claim 1.

In view of the amendment to claim 1, which now recites that the knob-like projections are formed on the smooth matte side surface of the copper foil, Applicant submits that the claim does not read on the "shiny side" of *Fatcheric*. Thus, the matte side of *Fatcheric* having a surface roughness of 4 to 7.5 μm should be compared to claim 1 which recites a matte side surface roughness of 2.2 to less than 4 μm . As shown from this comparison, *Fatcheric* does not anticipate amended claim 1.

Fatcheric does not disclose knob-like projections formed intermittently on the smooth matte side surface of the electrodeposited copper foil and a surface roughness of the smooth matte side of 2.2 to less than 4 μm . Therefore, *Fatcheric* does not disclose the elements as recited in claim 1.

Regarding claims 4-6, Applicant respectfully submits that *Fatcheric* does not disclose using a copper plating layer on the rough surface.

Fatcheric discloses depositing micro nodules of copper and a protective layer of, for example, zinc, nickel and cobalt. (Col. 5, lines 7-17.) However, *Fatcheric* does not disclose forming a copper plating layer on the surface. Thus, *Fatcheric* does not disclose the elements as recited in claims 4-6.

Accordingly, withdrawal of the § 102 rejection of claims 1-6 based on *Fatcheric* is hereby solicited.

B. § 102 Rejection Based on *Wolski*

Applicant respectfully submits that *Wolski* does not disclose “an electrodeposited copper foil wherein knob-like projections are formed intermittently on its smooth matte side surface and a surface roughness thereof is 2.2 to less than 4 μm ” as recited in amended claim 1.

Wolski discloses an electroplated copper foil having a matte side that is very smooth and having no knob-like projections. (Col. 1, lines 11-13; Col. 5, lines 31-34.) Furthermore, the mountains and valleys formed on the copper foil of *Wolski* are **formed continuously** as demonstrated in Fig. 2. The surface roughness is **0.6 to 2.1 μm before roughening**, (Table 2),

and 1.1 to 2.2 μm after roughening, (Table 3). As noted in the present specification, *Wolski*, corresponding to Japanese Patent Publication No. 3313277, could not achieve the object of the present invention as described in the specification. (Specification, page 6, line 3 to page 7, line 2.)

The SEM photographs submitted during the interview show surface shapes of Example C and comparative Example D of the present specification. Comparative Example D corresponds to Example 3 of *Wolski* according to the kinds of additives, concentration of the electrolytic bath, and the properties of the foil. As shown in the SEM photographs, the shapes are apparently different between Example C and comparative Example D.

Wolski does not disclose an untreated smooth matte side surface having a surface roughness of 2.2 to less than 4 μm . Thus, *Wolski* does not disclose the elements as recited in amended claim 1.

Accordingly, withdrawal of the § 102 rejection of claims 1-2 and 4 is hereby solicited.

Claim Rejections - 35 U.S.C. § 103

Claims 3, 5 and 6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Wolski* in view of *Fatcheric*. In addition, in the Interview of April 10, 2006, the Examiner took the position that amended claim 1 would likely be obvious over *Fatcheric* and *Wolski*. Favorable reconsideration is requested.

Applicant respectfully submits that claims 3, 5 and 6 are not obvious over *Wolski* in view of *Fatcheric* and that amended claim 1 is not obvious over either *Fatcheric* or *Wolski* since the

present invention provides the unexpected result of an electrodeposited copper foil having a high frequency property and high peel strength.

The electrodeposited copper foil of the present invention has high peel strength and excellent high frequency property. Neither *Fatcheric* nor *Wolski* direct attention to a high frequency property. The present invention discloses forming knob-like projections intermittently on the smooth matte side surface of the untreated foil thereby allowing for roughening treating of the untreated foil to be performed under a weak condition. Based on the experimental result that the high frequency property depends on strength of roughening treating, the present invention realizes both a high frequency property and high peel strength because only a weak roughening treatment is performed. The fact that the knob-like projection is formed intermittently is an important reason why both the high frequency property and high peel strength can be achieved in the present invention.

Note that it is not possible for a *Fatcheric*-type copper foil to realize both a high frequency property and high peel strength, as disclosed in page 5, lines 9 to 15 of the present specification. There is no description in *Fatcheric* about achieving a high frequency property. Furthermore, *Fatcheric* cannot achieve good high frequency property because the surface roughness on the matte side of the copper foil is too large, and the mountains and valleys are formed continuously.

Note also that a *Wolski*-type copper foil needs strong roughening treatment to obtain high peel strength which brings about deterioration of the high frequency property, as written at page

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6, lines 19 to 23 of the present specification. Thus, the copper foil in *Wolski* cannot achieve both a high frequency property and a high peel strength property. *Wolski* discloses that low profiling of a matte side is required for a finely patterned printed circuit board, (col. 2, lines 23-31), however there is no description about the high frequency property. The present inventor engaged in the development of the copper foil of the present invention because the copper foil of *Wolski* cannot satisfy both the high frequency property and high peel strength. (Specification, page 6, line 7 to page 7, line 2.)

Thus, claims 3, 5 and 6 are non-obvious over *Wolski* in view of *Fatcheric* and claim 1 is non-obvious over *Wolski* and *Fatcheric*.

Accordingly, withdrawal of the § 103 rejection based on *Wolski* in view of *Fatcheric* is hereby solicited.

In view of the aforementioned amendments and accompanying remarks, Applicant submits that that the claims, as herein amended, are in condition for allowance. Applicant requests such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney to arrange for an interview to expedite the disposition of this case.

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If this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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